## What Is Claimed Is:

1	1. A method for generating code to perform anticipatory prefetching	
2	for data references, comprising:	
3	receiving code to be executed on a computer system;	
4	analyzing the code to identify data references to be prefetched; and	
5	inserting prefetch instructions into the code in advance of the identified	
6	data references, wherein inserting the prefetch instructions involves,	
7	attempting to calculate a stride value for a given data	
8	reference within a loop,	
9	if the stride value cannot be calculated, setting the stride	
10	value to a default stride value, and	
11	inserting a prefetch instruction to prefetch the given data reference for a	
12	subsequent loop iteration based on the stride value.	
1	2. The method of claim 1, further comprising allowing a system user	
2	to specify the default stride value.	
1	3. The method of claim 1, wherein calculating the stride value	
2	involves:	
3	identifying an induction variable for the stride value;	
4	identifying a stride function for the stride value; and	
5	calculating the stride value based upon the stride function and the	
6	induction variable.	
1	4. The method of claim 1, wherein inserting the prefetch instruction	
2	based on the stride value involves:	
3	calculating a prefetch cover distance by dividing a cache line size by the	
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4	stride value;		
5	calculating a prefetch ahead distance as a function of a prefetch latency,		
6	the prefetch cover distance and an execution time of a loop; and		
7	calculating a prefetch address by multiplying the stride value by the		
8	prefetch cover distance and the prefetch ahead distance and adding the result to an		
9	address accessed by the given data reference.		
1	5. The method of claim 1, wherein analyzing the code involves:		
2	identifying loop bodies within the code; and		
3	identifying data references to be prefetched from within the loop bodies.		
1	6. The method of claim 5, wherein analyzing the code to identify data		
2	references to be prefetched involves examining a pattern of data references over		
3	multiple loop iterations.		
1	7. The method of claim 1, wherein analyzing the code involves		
2	analyzing the code within a compiler.		
1	8. A computer-readable storage medium storing instructions that		
2	when executed by a computer cause the computer to perform a method for		
3	generating code to perform anticipatory prefetching for data references, the		
4	method comprising:		
5	receiving code to be executed on a computer system;		
6	analyzing the code to identify data references to be prefetched; and		
7	inserting prefetch instructions into the code in advance of the identified		
8	data references, wherein inserting the prefetch instructions involves,		
9	attempting to calculate a stride value for a given data		
10	reference within a loop,		

11	if the stride value cannot be calculated, setting the stride	
12	value to a default stride value, and	
13	inserting a prefetch instruction to prefetch the given data	
14	reference for a subsequent loop iteration based on the stride value.	
1	9. The computer-readable storage medium of claim 8, wherein the	
2	method further comprises allowing a system user to specify the default stride	
3	value.	
1	10. The computer-readable storage medium of claim 8, wherein	
2	calculating the stride value involves:	
3	identifying an induction variable for the stride value;	
4	identifying a stride function for the stride value; and	
5	calculating the stride value based upon the stride function and the	
6	induction variable.	
1	11. The computer-readable storage medium of claim 8, wherein	
2	inserting the prefetch instruction based on the stride value involves:	
3	calculating a prefetch cover distance by dividing a cache line size by the	
4	stride value;	
5	calculating a prefetch ahead distance as a function of a prefetch latency,	
6	the prefetch cover distance and an execution time of a loop; and	
7	calculating a prefetch address by multiplying the stride value by the	
8	prefetch cover distance and the prefetch ahead distance and adding the result to an	
9	address accessed by the given data reference.	
1	12. The computer-readable storage medium of claim 8, wherein	
2	analyzing the code involves analyzing the code within a compiler.	
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1	13. An apparatus that generates code to perform anticipatory		
2	prefetching for data references, comprising:		
3	a receiving mechanism that is configured to receive code to be executed		
4	on a computer system;		
5	an analysis mechanism that is configured to analyze the code to identify		
6	data references to be prefetched; and		
7	an insertion mechanism that is configured to insert prefetch instructions		
8	into the code in advance of the identified data references;		
9	wherein the insertion mechanism is configured to,		
10	attempt to calculate a stride value for a given data reference		
11	within a loop,		
12	set the stride value to a default stride value if the stride		
13	value cannot be calculated, and to		
14	insert a prefetch instruction to prefetch the given data		
15	reference for a subsequent loop iteration based on the stride value.		
1	14. The apparatus of claim 13, further comprising a configuration		
2	mechanism that is configured to receive the default stride value from a system		
3	user.		
1	15. The apparatus of claim 13, wherein while calculating the stride		
2	value, the insertion mechanism is configured to:		
3	identify an induction variable for the stride value;		
4	identify a stride function for the stride value; and to		
5	calculate the stride value based upon the stride function and the induction		
6	variable.		

1	16. The apparatus of claim 13, wherein the insertion mechanism is	
2	configured to:	
3	calculate a prefetch cover distance by dividing a cache line size by the	
4	stride value;	
5	calculate a prefetch ahead distance as a function of a prefetch latency, the	
6	prefetch cover distance and an execution time of a loop; and to	
7	calculate a prefetch address by multiplying the stride value by the prefetch	
8	cover distance and the prefetch ahead distance and adding the result to an address	
9	accessed by the given data reference.	
1	17. The apparatus of claim 13, wherein the apparatus resides within a	
2	compiler.	
1	18. A method for generating code to perform anticipatory prefetching	
2	for data references, comprising:	
3	receiving code to be executed on a computer system;	
4	analyzing the code to identify data references to be prefetched; and	
5	inserting prefetch instructions into the code in advance of the identified	
6	data references so that multiple prefetch instructions are issued for a given data	
7	reference;	
8	whereby the given data reference is prefetched even if the computer	
9	system drops a prefetch instruction for the given data reference.	
1	19. The method of claim 18, wherein inserting prefetch instructions	
2	involves ensuring that the multiple prefetch instructions for the given data	
3	reference are issued at different times, so that a single event is unlikely to cause	
4	all of the multiple prefetch instructions for the given data reference to be dropped	
5	by the computer system.	

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1	20. The method of claim 18, wherein inserting prefetch instructions
2	involves issuing each of the multiple prefetch instructions for the given data
3	reference in a different loop iteration.
1	21. The method of claim 18, wherein analyzing the code involves:
2	identifying loop bodies within the code; and
3	identifying data references to be prefetched from within the loop bodies.
1	22. The method of claim 21, wherein analyzing the code to identify
2	data references to be prefetched involves examining a pattern of data references
3	over multiple loop iterations.
1	23. The method of claim 18, wherein analyzing the code involves
2	analyzing the code within a compiler.
1	24. A computer-readable storage medium storing instructions that
2	when executed by a computer system cause the computer system to perform a
3	method for generating code to perform anticipatory prefetching for data
4	references, the method comprising:
5	receiving code to be executed on the computer system;
6	analyzing the code to identify data references to be prefetched; and
7	inserting prefetch instructions into the code in advance of the identified
8	data references so that multiple prefetch instructions are issued for a given data
9	reference;
10	whereby the given data reference is prefetched even if the computer

system drops a prefetch instruction for the given data reference.

1	25. The computer-readable storage medium of claim 24, wherein
2	inserting prefetch instructions involves ensuring that the multiple prefetch
3	instructions for the given data reference are issued at different times, so that a
4	single event is unlikely to cause all of the multiple prefetch instructions for the
5	given data reference to be dropped by the computer system.
1	26. The computer-readable storage medium of claim 24, wherein
2	inserting prefetch instructions involves issuing each of the multiple prefetch
3	instructions for the given data reference in a different loop iteration.
1	27. The computer-readable storage medium of claim 24, wherein
2	analyzing the code involves analyzing the code within a compiler.
1	28. An apparatus that generates code to perform anticipatory
2	prefetching for data references, comprising:
3	a receiving mechanism that is configured to receive code to be executed
4	on a computer system;
5	an analysis mechanism that is configured to analyze the code to identify
6	data references to be prefetched; and
7	an insertion mechanism that is configured to insert prefetch instructions
8	into the code in advance of the identified data references so that multiple prefetch
9	instructions are issued for a given data reference;
10	whereby the given data reference is prefetched even if the computer
11	system drops a prefetch instruction for the given data reference.
1	29. The apparatus of claim 28, wherein the insertion mechanism is
2	configured to ensure that the multiple prefetch instructions for the given data
3	reference are issued at different times, so that a single event is unlikely to cause

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block in the code.

4	all of the mu	ltiple prefetch instructions for the given data reference to be dropped
5	by the comp	uter system.
1	30.	The apparatus of claim 28, wherein the insertion mechanism is
2	configured to	issue each of the multiple prefetch instructions for the given data
3	reference in	a different loop iteration.
1	31.	The apparatus of claim 28, wherein the apparatus resides within a
2	compiler.	
1	32.	A method for generating code to perform anticipatory prefetching
2	for data refer	rences, comprising:
3	receiv	ving code to be executed on a computer system;
4	analy	zing the code to identify data references to be prefetched; and
5	insert	ting prefetch instructions into the code in advance of the identified
6	data referenc	es;
7	where	ein inserting the prefetch instructions involves,
8		identifying a location in the code where a prefetch address
9		for a given prefetch instruction is calculated, and
10		inserting the given prefetch instruction as far ahead of a
11		corresponding data reference operation as possible, but not before
12		the location where the prefetch address is calculated.
1	33.	The method of claim 32, wherein inserting the given prefetch
2	instruction ca	an involve inserting the given prefetch instruction into a preceding

1	34. The method of claim 33, wherein inserting the given prefetch		
2	instruction involves:		
3	tracing execution of the code to produce an execution trace;		
4	using the execution trace to identify a preceding block in which the		
5	prefetch address is calculated; and		
6	inserting the given prefetch instruction into the preceding block after the		
7	location where the prefetch address is calculated.		
1	35. The method of claim 32, wherein analyzing the code involves:		
2	identifying loop bodies within the code; and		
3	identifying data references to be prefetched from within the loop bodies.		
1	36. The method of claim 35, wherein analyzing the code to identify		
2	data references to be prefetched involves examining a pattern of data reference		
3	over multiple loop iterations.		
1	37. The method of claim 32, wherein analyzing the code involves		
2	analyzing the code within a compiler.		
1	38. A computer-readable storage medium storing instructions that		
2	when executed by a computer cause the computer to perform a method for		
3	generating code to perform anticipatory prefetching for data references, the		
4	method comprising:		
5	receiving code to be executed on a computer system;		
6	analyzing the code to identify data references to be prefetched; and		
7	inserting prefetch instructions into the code in advance of the identified		
3	data references;		
)	wherein inserting the prefetch instructions involves,		
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1	identifying a location in the code where a prefetch address	
2	for a given prefetch instruction is calculated, and	
3	inserting the given prefetch instruction as far ahead of a	
4	corresponding data reference operation as possible, but not before	
5	the location where the prefetch address is calculated.	
1	39. The computer-readable storage medium of claim 38, wherein	
2	inserting the given prefetch instruction can involve inserting the given prefetch	
3	instruction into a preceding block in the code.	
1	40. The computer-readable storage medium of claim 38, wherein	
2	inserting the given prefetch instruction involves:	
3	tracing execution of the code to produce an execution trace;	
4	using the execution trace to identify a preceding block in which the	
5	prefetch address is calculated; and	
6	inserting the given prefetch instruction into the preceding block after the	
7	location where the prefetch address is calculated.	
1	41. The computer-readable storage medium of claim 38, wherein	
2	analyzing the code involves analyzing the code within a compiler.	
_	analyzing the code involves analyzing the code within a compiler.	
1	42. An apparatus that generates code to perform anticipatory	
2	prefetching for data references, comprising:	
3	a receiving mechanism that is configured to receive code to be executed	
4	on a computer system;	
5	an analysis mechanism that is configured to analyze the code to identify	
6	data references to be prefetched; and	

7	an insertion mechanism that is configured to insert prefetch instructions	
8	into the code in advance of the identified data references;	
9	wherein the insertion mechanism is configured to,	
10	identify a location in the code where a prefetch address for	
11	a given prefetch instruction is calculated, and to	
12	insert the given prefetch instruction as far ahead of a	
13	corresponding data reference operation as possible, but not before	
14	the location where the prefetch address is calculated.	
1	43. The apparatus of claim 42, wherein the insertion mechanism is	
2	configured to insert the given prefetch instruction into a preceding block in the	
3	code.	
1	44. The apparatus of claim 43, wherein the insertion mechanism is	
2	configured to:	
3	trace execution of the code to produce an execution trace;	
4	use the execution trace to identify a preceding block in which the prefetch	
5	address is calculated; and to	
6	insert the given prefetch instruction into the preceding block after the	
7	location where the prefetch address is calculated.	
1	45. The apparatus of claim 42, wherein the apparatus resides within a	
2	compiler.	